COMPETENCY STANDARDS

KNX CERTIFIED DEVICES INSTALLATION AND PROGRAMMING

ELECTRICAL AND ELECTRONICS SECTOR

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY
East Service Road, South Luzon Expressway, Taguig City, Metro Manila

Technical Education and Skills Development Act of 1994
(Republic Act No. 7796)

Section 22, "Establishment and Administration of the National Trade Skills Standards" of the RA 7796 known as the TESDA Act mandates TESDA to establish national occupational skills standards. The Authority shall develop and implement a certification and accreditation program in which private industry group and trade associations are accredited to conduct approved trade tests, and the local government units to promote such trade testing activities in their respective areas in accordance with the guidelines to be set by the Authority.

The Competency Standards (CS) serve as basis for the development of:

1. Competency-Based Curriculum;
2. Micro-Credential; and
3. Institutional Assessment Instruments

The CS has two sections:

Section 1 **Definition** describes and defines the competencies that comprise the Competency Standards.

Section 2 **Competency Standards** gives the specifications of competencies required for effective work performance.

The competency standards in this document was developed through adopt and adapt process, benchmarking with APEC Human Resources Working Group's Training Package on Caregiver Digital Upskilling published in July 2022 as the main reference, amongst many other international references. The micro competencies were validated with industry experts from TVET, academe, associations and stakeholders specializing in caregiving services.

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SECTION 1 KNX CERTIFIED DEVICES INSTALLATION AND PROGRAMMING QUALIFICATION

The KNX Certified Devices Installation and Programming qualification consists of competencies that a candidate must achieve in order to perform installation, programming, testing and commissioning of KNX certified devices for commercial and residential building automation.

The unit of competency comprising this qualification includes:

Code	CORE COMPETENCIES
CS-ELC741310	Perform installation, programming, testing and commissioning of KNX certified devices

A person who has achieved this Qualification is competent to be an:

- KNX programmer and installer

SECTION 2: COMPETENCY STANDARDS

This section gives the details of the contents of the core unit of competency required for KNX Certified Devices Installation and Programming.

CORE COMPETENCIES

UNIT OF COMPETENCY : **PERFORM INSTALLATION, PROGRAMMING, TESTING AND COMMISSIONING OF KNX CERTIFIED DEVICES**

UNIT CODE : **CS-ELC741310**

UNIT DESCRIPTOR : This unit of competency covers the knowledge, skills and attitudes necessary to install, program, diagnose, test and commission basic KNX certified devices and systems for commercial and residential building automation.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for installation	1.1 Work instructions are read and interpreted to determine job requirements. 1.2 ***Tools*** and ***testing devices*** needed to carry out the installation work are selected in accordance with established procedures 1.3 Tools and testing devices are checked for correct operation and safety. 1.4 ***Materials*** and KNX devices necessary to complete the work are obtained in accordance with job requirements. 1.5 ***ETS software*** is installed and project details is made in accordance with the job requirements 1.6 KNX product/manufacturers catalogs are imported in ETS6 as per job requirements	1.1 Interpretation of electrical drawing, schematic and wiring diagram. 1.2 Usage and function of KNX devices in the line/job requirements 1.3 Motor and other equipment specifications for the selection of control devices. 1.4 Applicable standards (i.e. IEC,UL, ANSI, NEMA) in mounting of MCC and other controllers 1.5 Electrical control components and devices 1.6 Safe working habits/ Safety procedures 1.7 Familiarization of ETS software	1.1 Interpreting electrical drawing, schematic and wiring diagram 1.2 Checking and quantifying items needed in the job requirement 1.3 Checking the required rating based on its specification in accordance with standard. 1.4 ETS installation and configuration
2. Install KNX devices and system components	2.1 Appropriate ***personal protective equipment*** is worn in line with standard operating procedures. 2.2 ***Occupational Health and Safety policies*** **and** ***procedures*** for installation are followed in line with the job requirements.	2.1 OHS policies and procedures 2.2 Lay-out and dimensions of electrical drawing or wiring diagrams of field and control devices 2.3 Types and uses of termination in the control panel	2.1 Interpreting electrical wiring diagram of motor control and other equipment system 2.2 Terminating skills in electrical control based on the standard

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.3 ***KNX Devices and system components*** are installed in accordance with manufacturer's instructions and/or as per diagram and configuration requirements 2.4 ***KNX actuators/devices*** are wired and labelled in accordance with manufacturer's instructions and/or as per diagram and configuration requirements	2.4 Proper procedure of mounting and installation of KNX devices in the control panel 2.5 KNX bus devices 2.6 KNX system overview 2.7 KNX TP topology 2.8 KNX TP installation procedure	2.3 Conduct continuity testing 2.4 Mounting and location placement of KNX devices and components 2.5 Harnessing and terminating Bus cable
3. Create, download and test basic KNX program	3.1 KNX Project details is created based on the job requirement 3.2 Manufacturers catalogs are imported based on the job requirements 3.3 Building structure is created based on the job requirements 3.4 KNX devices are added in in the ETS programming flatform for parameterization 3.5 Links between KNX devices is established based on the manufacturer's instruction and job requirement 3.6 KNX devices parameters are adjusted/programmed based on the manufacturer's instruction and job requirement 3.7 KNX project design is downloaded and device operation assignment is tested based on the diagram and parameters requirements 3.8 KNX actuator channels are labeled, wired and installed based on the layout diagram and manufacturer's instruction 3.9 Created KNX project design is tested/run and modified to correct all program/system errors	3.1 Creating, editing and saving KNX project details/design 3.2 Importing KNX device and manufacturer's catalog in ETS 3.3 KNX topology 3.4 KNX arguments and communication system 3.5 Programming KNX devices 3.5.1 Switching function 3.5.2 Dimming function 3.5.3 Blinds and shutter function 3.5.4 Heating, ventilation and air conditioning function 3.5.5 Energy management function 3.5.6 Remote control function 3.5.7 Audio-video function 3.5.8 Building automation and intelligent function 3.5.9 KNX and PLC interworking function 3.6 Procedures in downloading and unloading KNX program 3.7 KNX commissioning and ETS diagnostic	3.1. Computer operation skills 3.2. Basic KNX programming skills 3.3. Adjusting/ Editing KNX device parameter setting 3.4. Performing test and commissioning activities KNX program 3.5. Skills in logic sequence operation 3.6. Documentation skills 3.7. Communication skills (both written & oral)

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Set interworking of PLC program and KNX program	4.1 PLC program is created with Input/output assignment and labels based on the diagram and configuration requirements 4.2 KNX Project details/ ***building structure*** is created based on the job requirement 4.3 KNX devices with its Manufacturers catalogs are imported and added in the ETS programming flatform for parameterization 4.4 KNX devices and ***Siemens LOGO devices*** are interlinked via CMK interface and industrial ethernet switch based on the manufacturer's instruction 4.5 KNX devices parameters and LOGO configuration are set and/or adjusted/ programmed based on the manufacturer's instruction and job requirement 4.6 Interworking of KNX program and LOGO program is downloaded and device operation assignment is tested and modified based on the diagram and parameters requirements	4.1 PLC programming 4.2 Programming KNX devices 4.2.1 Switching function 4.2.2 Dimming function 4.2.3 Blinds and shutter function 4.2.4 Heating, ventilation and air conditioning function 4.2.5 Energy management function 4.2.6 Remote control function 4.2.7 Audio-video function 4.2.8 Building automation and intelligent function 4.2.9 KNX and PLC interworking function 4.3 Procedures in downloading and unloading KNX program 4.4 KNX commissioning and ETS diagnostic 4.5 Setting interworking of KNX and PLC program	4.1 PLC programming skills 4.2 KNX Programming skills 4.3 ETS and PLC commissioning 4.4 Manipulation of ETS diagnostic tools
5. Test and commission KNX devices and systems	5.1 Health, safety policies and procedures, environmental standards are followed in accordance with duly accepted national and international safety standards 5.2 Test data forms are filled-out and submitted to immediate superior for evaluation 5.3 Established testing procedures are followed in line with job requirements and established testing and quality assurance procedures 5.4 KNX devices and systems are commissioned in line with established procedures	5.1 Health, safety policies and procedures 5.2 environmental standards 5.3 Proper use of power tools and equipment in an installation. 5.4 Proper use of PPEs and safety harness 5.5 PLC programming 5.6 Programming KNX devices 5.7 KNX commissioning and ETS diagnostic 5.8 Setting interworking of KNX and PLC program 5.9 Commissioning procedures	5.1 Applying safety procedures 5.2 Performing testing procedure 5.3 Using PPE and safety harness properly 5.4 KNX programming skills 5.5 Commissioning skills 5.6 Troubleshooting skills 5.7 Documentation skills

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	5.5 Devices operation is tested before energizing the system to ensure personal and electrical safety and system program is tested while the system is energized to verify correct operation of the new installation 5.6 Unforeseen events and/or circuit problems (electrical faults and program errors) originating from the work of related trade are responded in line with established procedures and as per plans and drawings 5.7 Records, project designs and KNX programs are revised/updated according to changes incurred during commissioning	5.10 Troubleshooting procedures on KNX devices and systems 5.11 Documentation of the commissioning process 5.12 Documentation of final data result of commissioning process	
6. Notify completion of work	6.1 Final checks are made to ensure that work conforms with instructions and to requirements 6.2 Function chart is filled out as per actual installation 6.3 Completion report is prepared and submitted to appropriate officer 6.4 Work area is monitored as to cleanliness and safety 6.5 Updated drawings and other related documentation after installation work is finalized and provided to the customer as built plan 6.6 Orientation and technical assistance are provided to customers and/or prospective operators based on company procedures	5.1 Procedures in checking and conforming the installation based on job requirement 5.2 Filling out Function chart forms 5.3 Procedures in report preparation and submission 5.4 Principles of good housekeeping	5.1 Performing commissioning activities 5.2 Preparing function chart, written report, as built plan drawing 5.3 Performing good housekeeping

RANGE OF VARIABLES

VARIABLE	RANGE
1. Tools	May include: 1.1. Hand tools: 1.1.1. Pliers; assorted 1.1.2. Screwdrivers; assorted 1.1.3. Wrenches; assorted 1.1.4. Wire strippers and cutters 1.2. Power Tools 1.2.1. Cordless screw driver 1.2.2. Electric drill 1.2.3. Oscillating multifunction tool
2. Test equipment/ devices	May include: 2.1. Multi-tester (VOM) 2.2. Signal generator 2.3. Low voltage power supply (DC) 2.4. Computers (PC/laptop)/Programming console 2.5. LAN Tester
3. Materials and components	May include: 3.1. Programmable Logic Controller (PLC)/Siemens LOGO 3.2. Control wires 3.3. Terminal lugs 3.4. Terminal blocks and Din rail 3.5. Terminal wire marker 3.6. Mounting plate/Control panel 3.7. Sensors 3.8. Push-buttons/Limit switches 3.9. Relays 3.10. Power supply (24VDC) 3.11. PLC interface cables 3.12. TP wire/Bus cable 3.13. Patch cable 3.14. KNX bus connector (Red/back, White/Yellow)
4. ETS software	4.1. Engineering Tools Software (ETS4) 4.2. Engineering Tools Software (ETS5) 4.3. Engineering Tools Software (ETS6)
5. Personal protective equipment	May include: 5.1. Safety helmet (hard hat/bump hat) 5.2. Safety shoes 5.3. Ear muffs 5.4. Proper working clothes 5.5. Safety glass 5.6. Working gloves
6. Occupational Health & Safety (OH & S) policies and procedures	May include: 6.1. Philippine Electrical Code (PEC) 6.2. National Building Code 6.3. OH & S guidelines 6.4. Philippine environmental laws

VARIABLE	RANGE
7. KNX devices and system components	May include: 7.1. KNX Switch actuator 7.2. KNX Dimming actuator 7.3. KNX Multifunctional actuator 7.4. KNX DALI gateway 7.5. KNX power supply 7.6. KNX Universal interface 7.7. KNX Line coupler 7.8. KNX USB interface 7.9. KNX Shutter actuator 7.10. KNX presence sensor 7.11. KNX Push button switch 1-4 folds 7.12. KNX Touch Panel 7.13. KNX thermostat switch 7.14. KNX LOGO gateway 7.15. KNX IP router 7.16. KNX room temperature controller 7.17. KNX brightness and motion control 7.18. KNX LED dimming actuator 7.19. Bus cable and connectors
8. Program language	May include but not limited to: 8.1. Ladder 8.2. STL (Statement List) 8.3. Function block
9. Building Structure	May include but not limited to: 9.1. Building name (e.g. electrical workshop) 9.2. Building parts 9.2.1. First floor 9.2.2. Second floor 9.3. Rooms 9.3.1. Lecture room 9.3.2. Storage room 9.3.3. Laboratory 9.3.4. Comfort room 9.3.5. Staircase 9.3.6. Lobby • Distribution board • KNX Devices
10. Siemens LOGO Devices	10.1. Programmable relay (LOGO) 10.2. Industrial ethernet switch (Scalance) 10.3. KNX/LOGO gateway (CMK2000) 10.4. LOGO Power supply 10.5. LOGO expansion module

EVIDENCE GUIDE

1. Critical aspect of competency	Assessment requires evidence that the candidate: 1.1 Planned and prepared for KNX installation and programming 1.2 Installed and tested field and control devices 1.3 Created, installed and tested basic KNX program 1.4 Set interworking of PLC Program and KNX program via KNX/LOGO gateway
2. Resource Implication	The following resources should be provided: 2.1 Tools 2.2 Test equipment/instruments 2.3 Field and control devices 2.4 Materials 2.5 PPE 2.6 Technical manuals 2.7 PLC System 2.8 KNX devices and components 2.9 Appropriate equipment
3. Method of assessment	The assessor may select two of the following assessment methods to objectively assess the candidate: 3.1 Written test or examination 3.2 Demonstration with oral questioning 3.3 Portfolio
4. Context of Assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

GLOSSARY OF TERMS

GENERAL

1) **Common Competencies** - are the skills and knowledge needed by all people working in a particular industry.

2) **Competency** - is the possession and application of knowledge, skills and attitudes to perform work activities to the standard expected in the workplace.

3) **Competency Assessment -** is the process of collecting evidence and making judgments on whether competency has been achieved.

4) **Competency Standard (CS)** - is the industry-determined specification of competencies required for effective work performance.

5) **Context of Assessment** - refers to the place where assessment is to be conducted or carried out.

6) **Core Competencies -** are the specific skills and knowledge needed in a particular area of work - industry sector/occupation/job role.

7) **Critical aspects of competency -** refers to the evidence that is essential for successful performance of the unit of competency.

8) **Elements** - are the building blocks of a unit of competency. They describe in outcome terms the functions that a person performs in the workplace.

9) **Evidence Guide** - is a component of the unit of competency that defines or identifies the evidences required to determine the competence of the individual. It provides information on critical aspects of competency, required knowledge, required skills, resource implications, assessment method and context of assessment.

10) **Level -** refers to the category of skills and knowledge required to do a job.

11) **Method of Assessment** - refers to the ways of collecting evidence and when, evidence should be collected.

12) **Performance Criteria** - are evaluative statements that specify what is to be assessed and the required level of performance.

13) **Qualification** - is a cluster of units of competencies that meets job roles and is significant in the workplace. It is also a certification awarded to a person on successful completion of a course in recognition of having demonstrated competencies in an industry sector.

14) **Range of Variables** - describes the circumstances or context in which the work is to be performed.

15) **Resource Implications -** refers to the resources needed for the successful performance of the work activity described in the unit of competency. It includes work environment and conditions, materials, tools and equipment.

16) **Basic Competencies -** are the skills and knowledge that everyone needs for work.

17) **Required Knowledge -** refers to the competency that involves in applying knowledge to perform work activities. It includes specific knowledge that is essential to the performance of the competency.

18) **Required Skills** - refers to the list of the skills needed to achieve the elements and performance criteria in the unit of competency. It includes generic and industry specific skills.

19) **Unit of Competency** – is a component of the competency standards stating a specific key function or role in a particular job or occupation; it is the smallest component of achievement that can be assessed and certified under the PTQF.

SECTOR SPECIFIC

1) **Technical Terms**. All technical terms are used with meanings as defined in the latest published edition of the Philippine Electrical Code, in applicable laws, such as R.A. 7920 (The New Electrical Engineering Law), and current electrical engineering practice.

2) **Other Terms**. All other terms are used as defined in applicable TESDA documents.

REFERENCES:

https://www.tesda.gov.ph/Download/DownloadTR
- Electrical Installation and Maintenance NC IV

https://worldskills.org/what/projects/wsos/2024/events/579/skills/1677/

World Skills Competition Electrical Installation Technical Descriptions

WSC2022SE_18_Electrical_Installations_marking_scheme.xls

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